

IN THE CLAIMS:

1. (Currently Amended) A method of detecting a predetermined alarm condition in a combustion emission gas, the method comprising:

exposing to the gas a semiconductor gas sensor having a p-type semiconducting material, the semiconducting material ~~being responsive both to a change in concentration of a reducing gas in the surrounding atmosphere and to a change in concentration of oxygen in the surrounding atmosphere to exhibit a change in its electrical resistance~~ changing electrical resistance in relation to the concentrations of oxygen and carbon monoxide in the surrounding atmosphere over at least a range of atmospheric compositions via an expression of the form

$$R_G = A[O_2]^{-1/x} + B[O_2]^{-1/x} [CO]^{1/2},$$

where R_G is the observed sensor resistance, O_2 is the oxygen concentration, CO is the carbon monoxide concentration, A, B are constants which depend on the sensor resistance under reference conditions, and x is a parameter which depends on the point defect chemistry of the oxide system;

monitoring the resistance; and

outputting an alarm signal if the resistance exceeds a predetermined value corresponding to the alarm condition.

2. (Currently Amended) [[A]] The method according to claim 1, wherein the reducing gas is one of CO, H₂, CH₄ and higher hydrocarbons.

3. (Cancelled)

4. (Currently Amended) [[A]] The method according to ~~any of the preceding claims;~~ claim 1 wherein the p-type semiconductor material comprises a metal oxide.
5. (Currently Amended) [[A]] The method according to ~~any of claims~~ claim 1 ~~[[to 3,]]~~ wherein the p-type semiconductor material comprises a mixed metal oxide.
6. (Currently Amended) [[A]] The method according to claim 4 or claim 5, wherein the metal is of the first, second and/or third order transition metal series.
7. (Currently Amended) [[A]] The method according to claim ~~[[6]]~~ 1, wherein the ~~semiconductor~~ p-type semiconductivity material comprises a p-type oxide of the CrTi-O system.
8. (Currently Amended) [[A]] The method according to claim ~~[[6]]~~ 1, wherein the ~~semiconductor~~ p-type semiconductivity material comprises a p-type Cr-Ti-Mn-Co system, CuO with TiO₂ or CoO with K₂O.
9. (Currently Amended) [[A]] The method according to ~~any of the preceding claims;~~ claim 1 wherein the combustion emission gas is a flue gas.
10. (Currently Amended) A combustion emission gas alarm system comprising:
a semiconductor gas sensor having a p-type semiconducting material, the semiconducting material ~~being responsive both to a change in concentration of a reducing gas in the surrounding atmosphere and to a change in concentration of oxygen in the surrounding atmosphere to exhibit a change in its electrical resistance~~ changing electrical resistance in relation to the concentration of oxygen and carbon monoxide in the surrounding atmosphere over at least a range of atmospheric compositions via an expression of the form

$$R_G = A[O_2]^{-1/x} + B[O_2]^{-1/x} [CO]^{1/2}$$

where R_G is the observed sensor resistance, O_2 is the oxygen concentration, CO is the carbon monoxide concentration, A, B are constants which depend on the sensor resistance under reference conditions, and x is a parameter which depends on the point defect chemistry of the oxide system; and

apparatus for monitoring the resistance of the semiconducting material and [[for]] issuing an alarm signal if the resistance exceeds a predetermined value corresponding to an alarm condition.

11. (Cancelled)

12. (Currently Amended) [[A]] The system according to claim 10 ~~or claim 11~~, wherein the p-type semiconducting material comprises a metal oxide.

13. (Currently Amended) [[A]] The system according to claim 10 ~~or claim 11~~, wherein the p-type semiconducting material comprises a mixed metal oxide.

14. (Currently Amended) [[A]] The system according to claim 12 or claim 13, wherein the metal is of the first, second and/or third order transition metal series.

15. (Currently Amended) [[A]] The system according to claim ~~13 or claim 14~~, 10 wherein the ~~semiconductor~~ p-type semiconducting material comprises a p-type oxide of the Cr-i-O system.

16. (Currently Amended) ~~[[A]]~~ The system according to claim ~~13 or claim 14~~ 10, wherein the ~~semiconductor~~ p-type semiconducting material comprises a p-type CuO with TiO₂ or CoO with TiO₂.

17. (Currently Amended) ~~[[A]]~~ The system according to ~~any of claims 10 to 16~~ claim 10 wherein the system is mounted to or adjacent to a flue gas outlet so as to expose the sensor to ~~a gas~~ the flue gas.